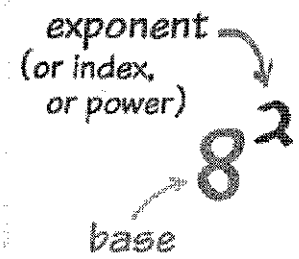
Laws of Exponents

Exponents are also called **Powers** or **Indices**



The exponent of a number says **how many times** to use the number in a **multiplication.**

In this example: $\mathbf{8^2 = 8 \times 8 = 64}$

- In words: 8^2 could be called "8 to the second power", "8 to the power 2" or simply "8 squared"

So an Exponent just saves you writing out lots of multiplies!

Example: a^7

$$a^7 = a \times a \times a \times a \times a \times a \times a = aaaaaaa$$

Notice how I just wrote the letters together to mean multiply? We will do that a lot here.

Example: $x^6 = xxxxxx$

The Key to the Laws

Writing all the letters down is the key to understanding the Laws

Example: $x^2x^3 = (xx)(xxx) = xxxxx = x^5$

Which shows that $\mathbf{x^2x^3 = x^5}$, but more on that later!

So, when in doubt, just remember to write down all the letters (as many as the exponent tells you to) and see if you can make sense of it.

All you need to know ...

The "Laws of Exponents" (also called "Rules of Exponents") come from three ideas:

The exponent says **how many times** to use the number in a multiplication.

A **negative exponent** means **divide**, because the opposite of multiplying is dividing

A fractional exponent like **1/n** means to **take the nth root:** $x^{\frac{1}{n}} = \sqrt[n]{x}$

Laws of Exponents

Here are the Laws (explanations follow):

Law	Example
$x^1 = x$	$6^1 = 6$
$x^0 = 1$	$7^0 = 1$
$x^{-1} = 1/x$	$4^{-1} = 1/4$
$x^m x^n = x^{m+n}$	$x^2x^3 = x^{2+3} = x^5$
$x^m/x^n = x^{m-n}$	$x^6/x^2 = x^{6-2} = x^4$
$(x^m)^n = x^{mn}$	$(x^2)^3 = x^{2\times3} = x^6$
$(xy)^n = x^n y^n$	$(xy)^3 = x^3y^3$
$(x/y)^n = x^n/y^n$	$(x/y)^2 = x^2 / y^2$
$x^{-n} = 1/x^n$	$x^{-3} = 1/x^3$

And the law about Fractional Exponents:

$$x^{\frac{m}{n}} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$$

$$x^{\frac{2}{3}} = \sqrt[3]{x^2} = (\sqrt[3]{x})^2$$

And That Is It!

If you find it hard to remember all these rules, then remember this:

you can work them out when you understand the three ideas at the top of this page

Oh, One More Thing ... What if x= 0?

Positive Exponent (n>0)	$0^n = 0$
Negative Exponent (n<0)	**Undefined!** (Because dividing by 0)
Exponent = 0	*Ummm* ... see below!

See more at: http://www.mathsisfun.com/algebra/exponent-laws.html

Name_____
Date_____Block_____

Properties of Exponents Practice

I. Concept:

1) A. $x + x =$ B. $x \cdot x =$ C. Are these the same?

2) Write out $3y^4$ the long way.

3) Multiplication is repeated addition, but exponents are _____ _____.

4). When multiplying expressions with the same base, I _____ the exponents. (like $a^b \cdot a^c$)

When dividing expressions with the same base, I _____ the exponents. (like $\frac{a^b}{a^c}$).

When raising a power to a power, I _____ the exponents. (like $(a^b)^c$

When adding like terms with exponents, I _____ _____ the exponents. (like $a^b + a^b$).

Anything to the zero power is _____.

5) Finding the number for each ? that makes the statement true.

A. $9 = 3^?$ B. $1 = 4^?$ C. $1 = 5^?$

D. $16 = 2^?$ E. $16 = 4^?$ F. $243 = 3^?$

G. $\frac{1}{10} = 10^?$ H. $\frac{1}{25} = 5^?$ J. $\frac{1}{16} = 2^?$